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Variations of anterior red band and sex determination of *Agrias narcissus tapajonus* Fassl (Lepidoptera, Nymphalidae) from Santarém, Brazil

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Abstract Forty-five *Agrias narcissus tapajonus* Fassl butterflies from Santarém, Brazil were classified according to their anterior red band extensions. The percentage of insects with red bands descending below vein 2 was significantly different between 22 males and 23 females (59% *vs* 26%, $p<0.05$). The frequency of subapical blue patches was also significantly different between males and females (82% *vs* 30%, $p<0.005$), and bore no relationship to their red band extensions. These findings suggest that *Agrias narcissus tapajonus* butterflies from Santarém have wide red band variations that are closely related to sex.

Key words *Agrias narcissus tapajonus,* Santarém, Brazil, red band extension, sexual differentiation.

Introduction

Agrias narcissus tapajonus Fassl butterflies are characterized by wide variations of anterior red band extensions. The red band extension differentiation is the major distinction for classifying the subspecies of *Agrias sardanapalus* Bates and/or *Agrias amydon* Hewitson. Fifteen forms or variations have been ascribed to *A. n. tapajonus* (Barselou, 1983). However, only 3 categories have been given to the red band extensions (*A. n. t.* f. *cyaneradiata* Le Moult, *A. n. t.* f. *dubiosa* Fassl and *A. n. t.* f. *semidubiosa* Michael). The population of these forms, however, has not yet been clearly determined.

This study analyzes 45 *A. n. t.* butterflies captured in Santarém, Brazil, from 1984 to 1989, and attempts to elucidate the population of each form and/or variation in relation to their red band extensions.

Materials and Methods

Forty-five butterflies were captured using banana traps (Inoue 1985) from 1984 to 1989. Of the 45 insects, 25 were caught 108 km from Santarém from 1984 to 1987. Four were netted 60 km from Santarém in 1987, and 13 were netted 106 km from Santarém in 1989. The remaining 3 specimens were hunted at Municipio de Prainha near the Rio Curuá Tinga in 1988. Twenty-three were female and 22 were male.

The specimens were classified into five groups by the basal red band extension on the anterior recto surface. The red band did not descend below vein 3 in Group 1 (Figure 1). The basal red band was seen between veins 2 and 3 in Group 2 (Figures 3 and 4). Vein 2 was sometimes red scaled in Groups 1 and 2 (Figure 1). The basal red band filled disc 2 entirely, but did not descend below vein 2 in Group 3 (Figures 5 and 6). Residual oval blue was seen at the basal corner of the cells in this group. The basal red coloring descended between veins 1b and 2 in Group 4 (Figures 7 and 8), and descended below vein 1b in Group 5 (Figures 9 and 10).

Statistical analyses were carried out by the chi-square method.

The nomenclature was done according to the criteria described by Barselou in 1983.

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Results

Of the 45 specimens, six (13%) were classified as Group 1, ten (22%) as Group 2, ten (22%) as Group 3, eight (18%) as Group 4, and eleven (25%) as Group 5. The percentage of insects in the five groups was 0%, 9%, 32%, 32% and 27% for the 22 males, and was 26%, 35%, 13%, 4% and 22% for the 23 females, respectively. No male was classified as Group 1. The basal red band did not fill entirely Groups 1 and 2's disc 2. The percentile differentiation between Groups 1 and 2 insects was significantly different between the males and the females (9% *vs* 61%, $p<0.001$). The basal red band descended below vein 2 in Groups 4 and 5. The percentage of insects was significantly different between the males and the females (59% *vs* 26%, $p<0.05$) in these two Groups.

The percentage of insects with red bands descending below vein 2 (Groups 4 and 5) was 36% for 25 insects captured at 108 km, 38% for 13 insects captured at 106 km, 75% for 4 insects captured at 60 km, and 67% for 3 insects captured at Municipio de Prainha.

Subapical blue patches were seen in 18 (82%) of the 22 males and in seven (30%) of the 23 females. This difference was highly significant ($p<0.005$). The percentage of insects with subapical blue patches in the five Groups was 50%, 86%, 86% and 83% for the 22 males, and was 17%, 38%, 33%, 0% and 40% for the 23 females, respectively. No significant differences were found among the five Groups.

A vestigial red patch enclosed by a posterior blue patch near the cell closure was seen in four (18%) of the 22 males and in one (4%) of the 23 females, all being of the same variation as *A. n. t.* f. *porphyrionis* Fassl. Of the four males, two were classified as Group 4 (Figure 11), and two were classified as Group 5 (Figure 12), and all these four insects had subapical blue patches. The singular female was classified as Group 5 and had a wide red band with no subapical blue patch (Figure 13). Two males were caught 108 km from Santarém. Two other males were captured 106 km and 60 km from the same city. The female was netted at Municipio de Prainha.

A large red patch was seen on the posterior recto surface of one (4%) of the 23 females (Figure 14). This female was classified as Group 5, being same as *A. n. t.* f. *illustrissimus* Fassl, and was captured by the author 108 km from Santarém.

Yellow arches on the anterior recto surface were seen in two (9%) of the 23 females. One was classified as Group 3 (Figure 15), being same as *A. n. t.* f. *icterica* Fassl and the other was classified as Group 5 (Figure 16), being same as *A. n. t.* f. *phryne* Bied. These two females had subapical blue patches, and were captured 108 km from Santarém.

The frequency of the anterior cell which was entirely filled by a red band was 0%, 0%, 0%, 25% and 100% in the five groups, respectively. No insect was found with a red band filling cell which did not descend below vein 2. Residual blue was seen at the basal part of the cell in six (75%) of the eight insects in Group 4 (Figures 8 and 11), although the basal red coloring descended below vein 2. Four (36%) of the 11 insects in Group 5 had a residual blue line at the basal disc 1b (Figures 9, 12 and 16). The blue arc at the anterior inner margin invaded disc 1b in 7 (64%) of the 11 insects in Group 5 and were of the same form as *A. n. t.* f. *dubiosa* Fassl (Figures 9, 12, 14 and 16). The blue or the black at the inner margin did not invade disc 1b in the remaining four insects (36%) and were the similar form to *A. sardanapalus sardanapalus* Bates (Figures 10 and 13).

Comment

This study shows that *Agrias narcissus tapajonus* from Santarém has wide variations of red

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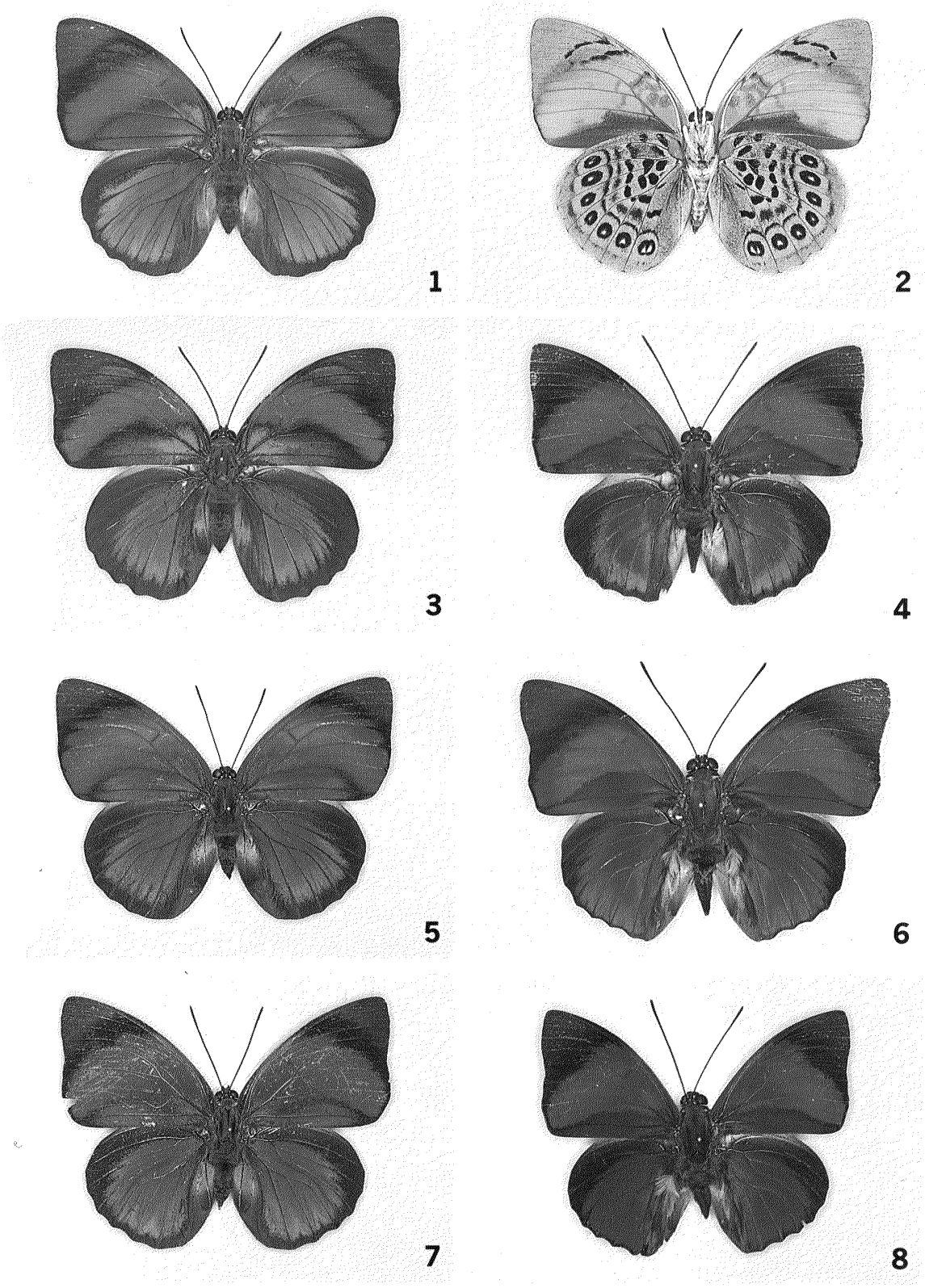

Agrias narcissus tapajonus Fassl. Fig. 1. Group 1, a female with red band descending to vein 3. Fig. 2. Verso of Fig. 16 f. *phryne* Bied. Figs. 3, 4. Group 2, a female and a male with red band descending to disc 2 between veins 2 and 3. Figs. 5, 6. Group 3, a female and a male with red band descending to vein 2. Figs. 7, 8. Group 4, a female and a male with red band descending to disc 1b between veins 1b and 2.

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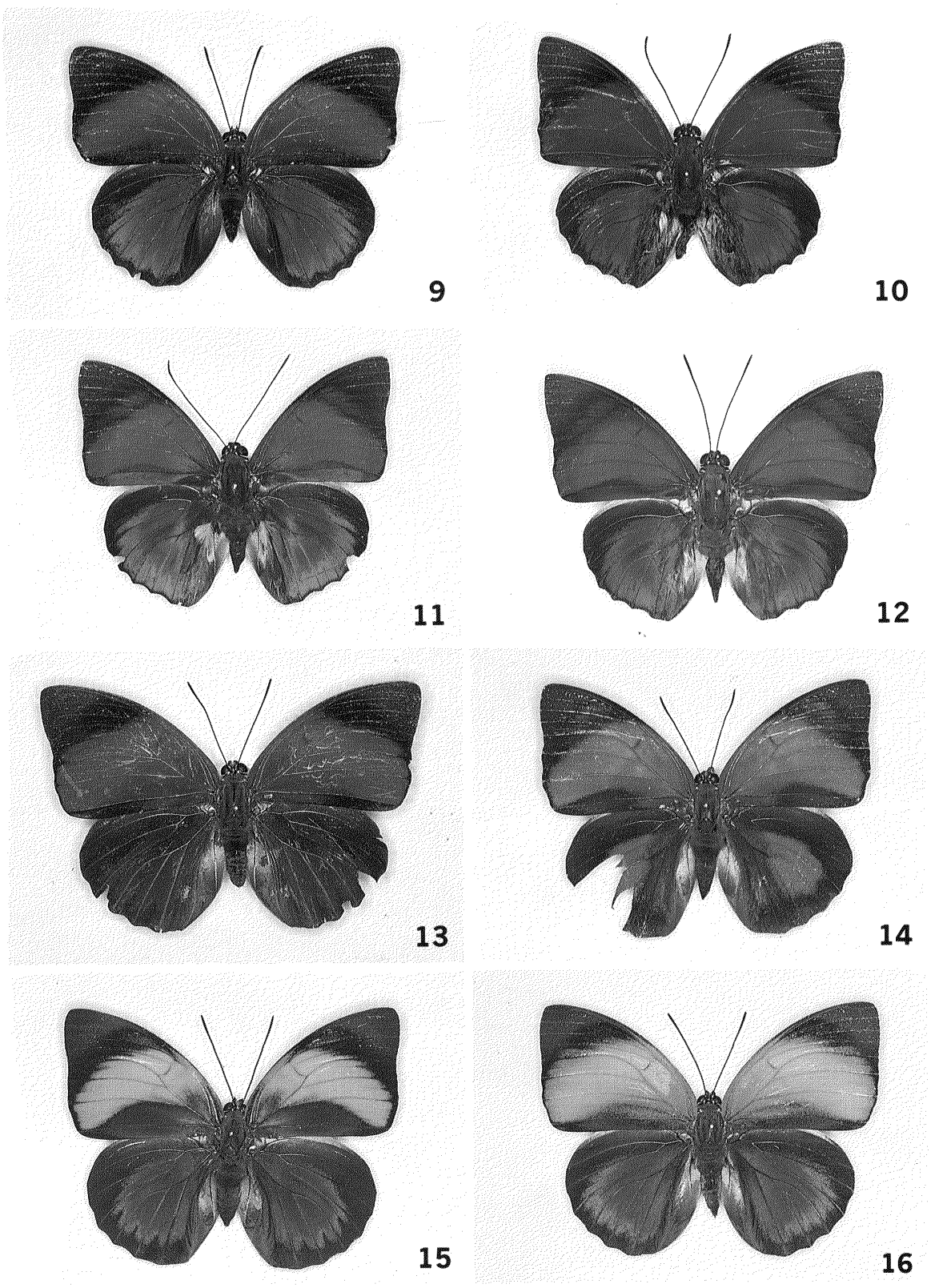

Figs. 9, 10. Group 5, a female and a male with red band descending below vein 1b. Fig. 11. Group 4 f. *porphyrionis* Fassl, male. Fig. 12. Group 5, f *porphyrionis* Fassl, male. Fig. 13. Group 5, f. *porphyrionis* Fassl, female. Fig. 14. Group 5, f. *illustrissimus* Fassl, female. Fig. 15. Group 3, f. *icterica* Fassl, female. Fig. 16. Group 5, f *phryne* Bied, female.

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band extensions on their anterior wings. The red band descended from vein 3 to below vein 1b in 45 butterflies captured in a small area. This wide variation has not been observed in *Agrias narcissus narcissus* Staudinger or *Agrias narcissus stoffeli* Mast de Maeght & Descimon. These two subspecies are found in the north of the Amazon River, while the *Agrias narcissus tapajonus* lives in the south of the Amazon. These facts suggest that *Agrias narcissus* has lost red band gene stability after they crossed the Amazon River from north to south.

This study shows that sexual differentiation of *Agrias narcissus tapajonus* can only be determined in the percentile differences of each variation. The percentage differences were statistically significant between the males and the females in those insects having red bands descending below vein 2 (59% *vs* 26%, $p<0.05$), as well as in those with subapical blue patches (82% *vs* 30%, $p<0.005$). There is no major difference between the males and the females in *Agrias narcissus narcissus*. On the other hand, females without blue coloring on their posterior wings are quite different from posterior blue marked *Agrias narcissus stoffeli* males. Sexual differentiation such as *A. sardanapalus sardanapalus* Bates is not a rare phenomenon in the genus *Agrias*. However, it is very rare for anterior red band extension to vary in relation to the sex of the insect.

Agrias narcissus tapajonus has three forms relating to red band extension. One criterion is that the cells are filled with the anterior red band and that the red band does not descend below vein 2. This is ascribed to *A. n. t.* f. *semidubiosa* Michael. However, no insect fulfills this same criterion in this study. None of 26 insects whose red bands do not descend below vein 2 (Groups 1, 2 and 3) has red filled cells. Residual blue is seen at the basal part of the cell in six (75%) out of the eight insects in Group 4 (Figures 8 and 11), although the basal red coloring descended below vein 2. A new criterion for *A. n. t.* f. *semidubiosa* is required.

This study presents a new form of *Agrias narcissus tapajonus* with a red band descending below vein 1b. Two different forms are found in 11 insects in Group 5, one being the same as *A. sardanapalus lecerfi* Lathy (Figures 9, 12, 14 and 16), and the other being the same as *A. sardanapalus sardanapalus* Bates (Figures 10 and 13). *A. n. t.* f. *dubiosa* Fassl form is given to those insects with red bands similar to *A. sardanapalus lecerfi*. The blue or the black at the inner margin does not invade the disc 1b in four of the 11 (36%) insects in Group 5. No criterion has been given for these butterflies similar to *A. sardanapalus sardanapalus*.

References

Barselou, P. E., 1983. *The genus* Agrias. 96 pp., 15 pls. Sciences Nat, Compiègne.
Inoue, T., 1985. Two females of the genus *Agrias* captured in Perú. *Tyô Ga* **36**: 103-105.

摘　　要

ブラジル，サンタレン産，ナルキサスミイロタテハ，タパジョース亜種（鱗翅目，タテハチョウ科）にみる前翅赤色帯の広がりの雌雄差について（井上武夫）

ブラジル，サンタレン産のナルキサスミイロタテハ，タパジョース亜種45頭を対象に，前翅起始部赤色帯の広がりを次のように5群に分類した．1群；第3翅脈まで(図1)，2群；第2，3翅脈の間まで(図3，4)，3群；第2翅脈まで（図5，6），4群；第1b，2翅脈の間まで（図7，8），5群；第1b翅脈の下まで（図9，10）．各群の頭数は6，10，10，8，11であった．雌23頭は各々6，8，3，1，5頭，雄22頭は

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各々0, 2, 7, 7, 6頭であった．1，2群を合計した比率は雌が雄に比べて有意に高く（61% 対 9%, $p<0.001$），反対に4，5群を合計した比率は雌が雄に比べ有意に低かった（26% 対 59%, $p<0.05$）．

前翅角部の青色斑の出現頻度は雌が雄に比べ有意に低かったが（30% 対 82%, $p<0.005$），前翅起始部赤色帯の広がりの程度とは関係がなかった．

前翅赤色帯が中室全てを覆うまで広がった例は1, 2, 3群には皆無で，4群の25%，5群の全例に認められた．第2翅脈までしか赤色帯の広がりがなくて，尚かつ中室全てを赤色帯が覆うという，*A.n.t.* f. *semidubiosa* Michael の基準をみたす例は45頭中皆無であった．

5群の11頭の内，7頭は赤色帯中央部に *A. sardanapalus lecerfi* Lathy（図9, 12, 14, 16）のような切り込みがみられたが，残る4頭には認められず（図10, 13），*A.n.t.* f. *dubiosa* Fassl とは異なる，新しい変異型と考えられた．

本研究により，ブラジル，サンタレン産のナルキサスミイロタテハ，タパジョース亜種には前翅起始部赤色帯の広がりの変化が著しいことが明らかにされた．雌雄に特異的な赤色帯の広がりはなく，その比率だけが雌雄間で有意に異なっていた．前翅角部の青色斑の出現頻度も雌雄間で有意に異なっていた．アマゾン北岸に生息する *A. n. narcissus* Staudinger には前翅赤色帯の広がりに変化がなく，雌雄差も認められない．同じ北岸のベネズエラに生息する *A. n. stoffeli* Mast de Maeght & Descimon の雌には後翅に青色斑が出現せず，雄とはまったく異なるが，ともに前翅赤色帯の広がりには変化がない．前翅赤色帯の広がりを支配する遺伝子がアマゾン北岸に生息する2亜種では安定しているが，南岸に生息する本亜種では安定していないと思われる．そのことから，本亜種は前翅赤色帯の広がりを支配する遺伝子が純化していない，まだ分化途中の若い亜種と考えられる．

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